



Beacons and Activation Requests

SAR Controllers Workshop 2020

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United States Coast Guard

Office of Search and Rescue





406 MHz Distress Beacons



EPIRB

Emergency
Position
Indicating
Radio
Beacons



ELTs

Emergency
Locator
Transmitter



PLB

Personal
Locator
Beacon



SSAS

Ship Security
Alert System

*** Most have a 121.5 homing signal, but not all SAR assets have Direction Finding capability.**

***Some countries code PLBs as ELTs**



406 MHz Distress Beacons

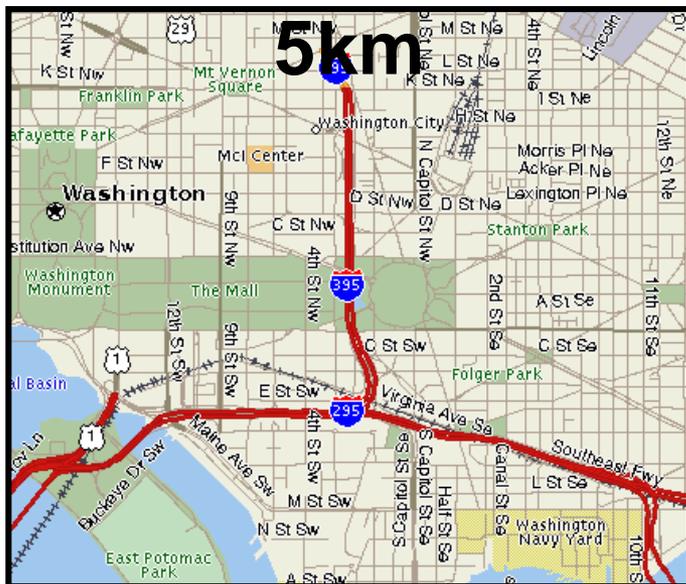


- Designed for satellite processing
- Global use
- 5-watt digital signal
- Unique beacon ID
- Rigid specs
- 3-5 km location accuracy
- ~ 100 meter accuracy with integrated GPS

Comparison: With & Without GNSS

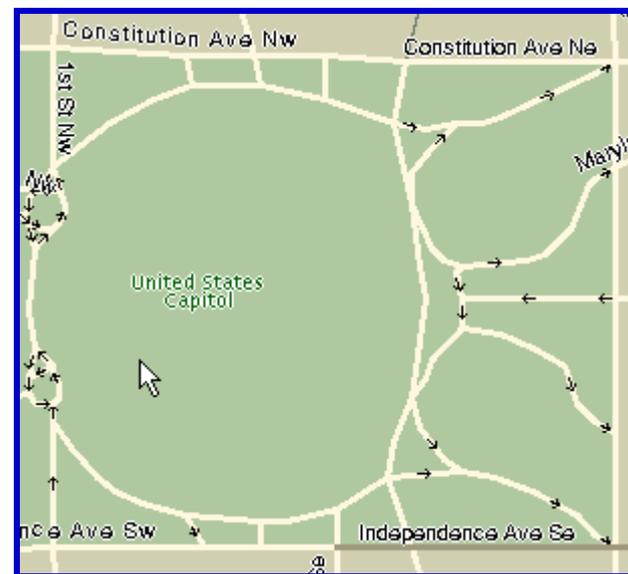


406 MHz –



**Search
Time: 2 - 3
hours**

**406 MHz w/GPS
= 100 m**



**Search Time:
Minimal**



406.0-406.1 MHz

- The International Telecommunication Union (ITU) manages frequency allocations internationally.
- ITU Radio Regulations state: **The use of the band 406-406.1 MHz by the mobile-satellite service is limited to low power satellite emergency position-indicating radio beacons**
- **Any emission capable of causing harmful interference to the authorized uses of the frequency band 406-406.1 MHz is prohibited.**
- If you discover intentional or unintentional interference, contact the USMCC.
 - D14 example

406 MHz Distress Beacon Carriage Regulations



Ships/Boats

- All vessels 300 tons or greater
- Vessels engaged in transporting 6 or more persons
- All comm fishing vsls (U.S.)
- All vessels in HI waters operating beyond 1 mile of shore (either 406 MHz EPIRB or VHF radio)



406 MHz Distress Beacon Carriage Regulations



Ships/Boats

- **Some U.S. state programs offer discounts for registration with proof of EPIRB or PLB**

406 MHz Distress Beacon Carriage Regulations



- Aircraft on international flights must carry an ELT
- U.S.: FAA mandates carriage of 406 MHz
 - Phase out of 121.5 MHz only





Algeria	Argentina	Australia
Brazil	Canada	Chile
China	Cyprus	Denmark
Finland	France	Germany
Greece	India	Indonesia
Italy	Japan	Korea
Malaysia	Netherlands	New Zealand
Nigeria	Norway	Pakistan
Peru	Poland	Qatar
Russia	Saudi Arabia	Serbia
Singapore	South Africa	Spain
Sweden	Switzerland	Togo
Thailand	Turkey	Tunisia
United Arab Emirates	United Kingdom	United States
Vietnam		

Cospas-Sarsat Participants

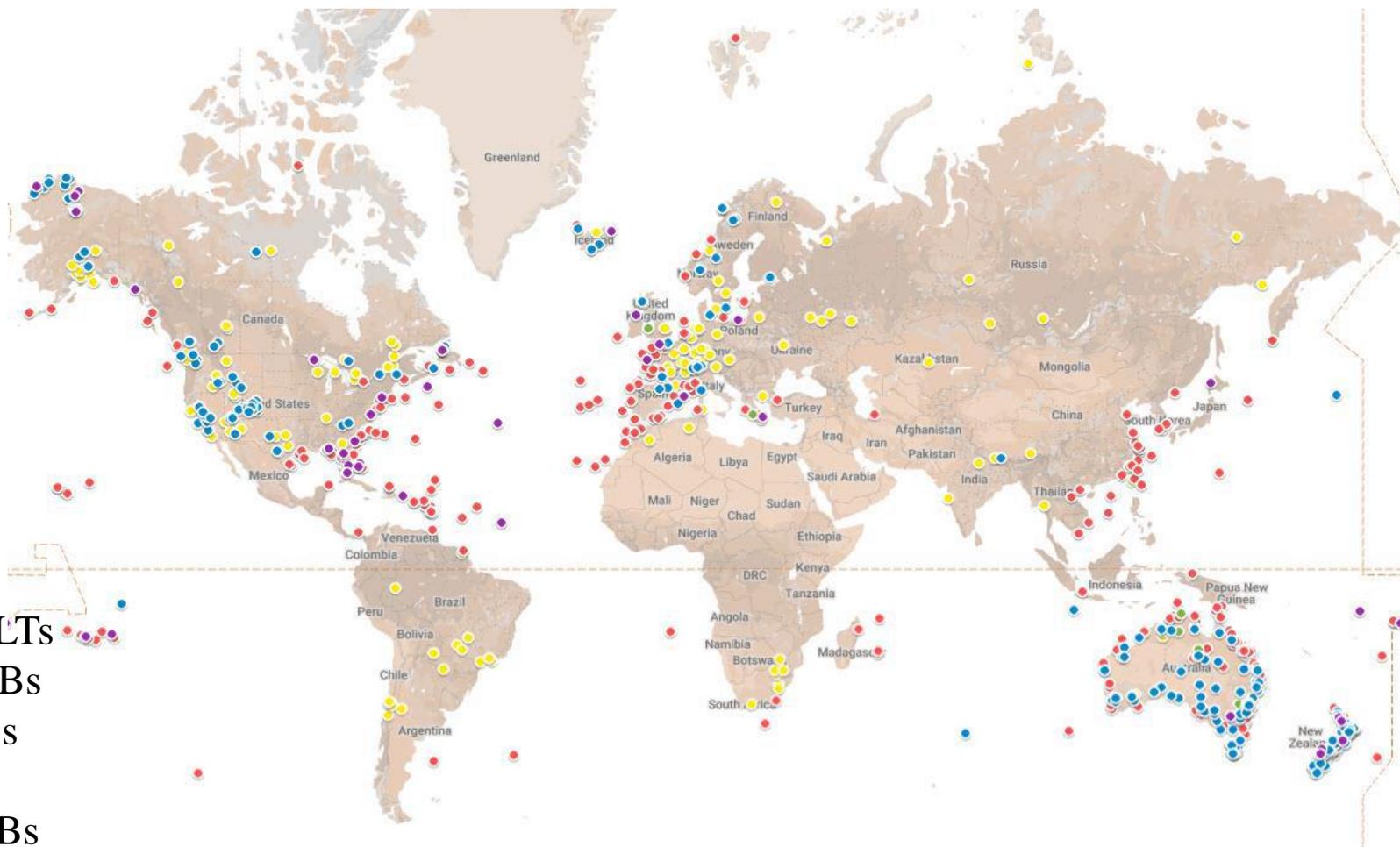
43 countries &
5
“organizations”

Participating Organizations

International Telecommunication Development Corporation – Taiwan; Marine Department of Hong Kong; European Organization for the Exploitation of Meteorological Satellites; European Commission; Indian Space Research Organization



2018: 2,185 people rescued in 904 SAR events

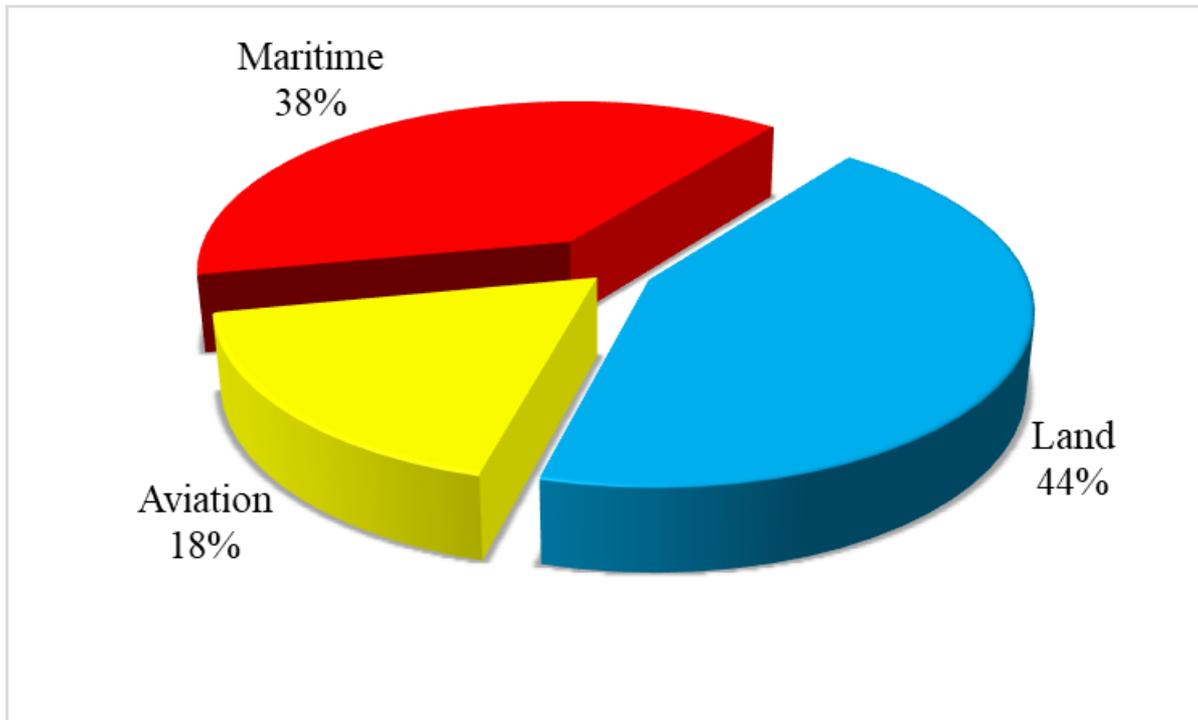


- Legend:
- In yellow: ELTs
 - In red: EPIRBs
 - In blue: PLBs (Land)
 - In green: PLBs (Aviation)
 - In purple: PLBs (Maritime)

**From September 1982 to December 2018:
48,738 people in 14,531 SAR events**



Cospas-Sarsat Saves Lives



Type of SAR Events Assisted by Cospas-Sarsat



406 MHz Distress Beacons

United States:

~605,000 beacons in NOAA's Registration Database

Globally: ~2.3 Mil





U.S. Government/Military Use

U.S. Govt/Military distress beacons

DoD registration maintained in
Joint SARSAT Electronic Tracking
System (JSETS)

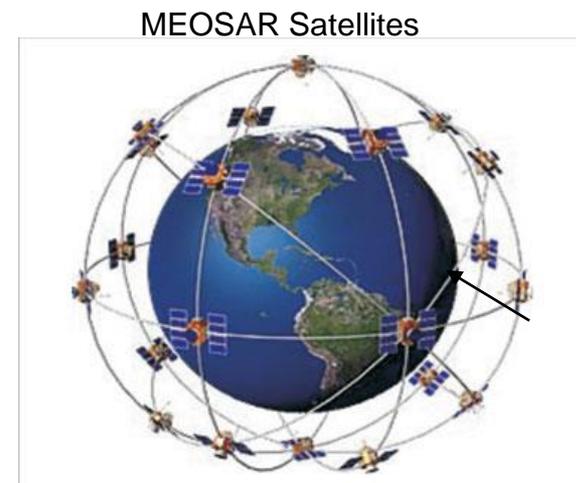
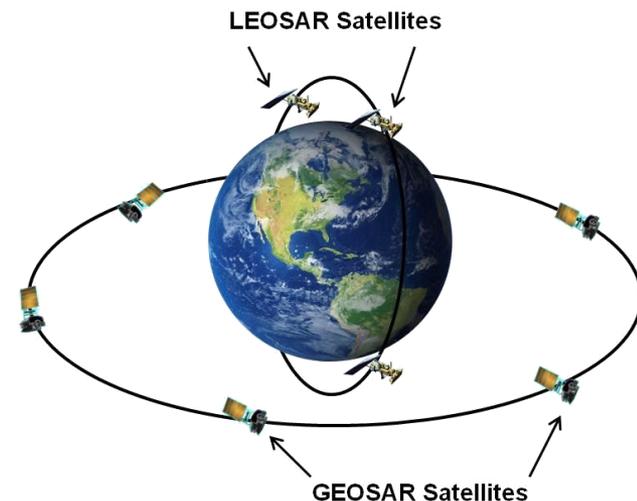




Space Segment

(3 types of satellites)

- **LEOSAR**
 - Low Earth Orbit Search And Rescue
 - 6 satellites (4 working/commissioned)
- **GEOSAR**
 - Geostationary Earth Orbit Search and Rescue
 - 9 Satellites
- **MEOSAR**
 - Medium Earth Orbit Search and Rescue
 - 45 Satellites





Cospas-Sarsat Ground Stations

– (60 LEOLUT, 26 GEOLUT, 17 MEOLUT)

Local User Terminals (LUTs)

- Track COSPAS and SARSAT LEOSAR satellites
- Recovers beacon signals
- Perform Doppler or Difference of Arrival (DOA) to determine position
- Sends distress alert to the Mission Control Center



Mission Control Centers



MCCs - 30 worldwide

- Receive alerts from U.S. LUTs and international MCCs
- Validate, match and merge distress alerts to improve location accuracy and determine the correct position
- Provides distress beacon registration info with distress alert
- Transmit alerts to Rescue Coordination Centers (RCCs) and SAR Points of Contact (SPOC) and filters redundant data



USMCC Suitland, MD

Most MCC functions are handled automatically; no manual intervention = higher efficiency!



Overloading the System

- **You can't!**
 - Also, keep the beacon active **until they are safe on a dry land or recovered on another vessel.**

Remember, crews might still need to DF to the 121.5 signal
 - RCCs can request the MCC turn off alerts in a specific area
- Hurricane Harvey and Irma some significant delays



Comic Relief

- Question:
 - What kind of music do the planets listen to?

Answer: “Nep-tunes”

I would also have accepted: “Satellite Radio”





U.S. SARSAT Program

Policy on Non-Distress Transmissions

- Applies to transmission of U.S. coded 406 MHz distress beacons type approved by COSPAS SARSAT for ...
- **self-test transmissions**
- **test-coded transmissions**
- **operationally coded transmissions**



Beacon Transmission

- **Self-Test Transmission** – an on-air transmission where the frame synch is reversed so that the Cospas-Sarsat space and ground segments do not process the beacon burst.
- **Test Protocol Transmission** – an on-air transmission where the coding of the beacon is modified so that Cospas-Sarsat recognizes it as a test transmission and does not forward it through the operational ground segment.
 - Polar Scout miscoded beacons
- **Operational Protocol Transmission** – an on-air transmission where the coding of the beacon corresponds to a distress alert and the resulting alert is treated as if it were an actual distress.



Non Distress Transmissions

- **Beacon Self-Test** – activation of an emergency beacon according to manufacturer’s instructions to *internally test the beacon unit and assure its operation.*
- **Testing** – activation of an emergency beacon according to manufacturer’s instructions and Federal agency requirements to ensure proper installation of the beacon and its component’s.
- **Training** – activation of an emergency beacon according to manufacturer’s instructions to train beacon users on the proper use and operation of a beacon or for Search and Rescue Response personnel to train in the use of direction finding (DF) and/or Homing equipment in locating the beacon or both.
- **Exercise** – a military maneuver or simulated operation involving planning, preparation, and execution that is carried out for the purpose of training and evaluation of SAR response which may involve activation of an emergency beacon exercise the end-to-end capability of the system.



Coordination – Self Test

- Beacon Self-test/ Built-In Test Transmission: No prior coordination necessary. Transmission should be limited to one burst or per manufacturer's instructions.
- 121.5 MHz will be broadcasted
- 406 MHz test code will be broadcasted
 - Both will be detected by our SAR assets





Coordination - Testing

- If using an anechoic chamber, no prior coordination necessary.
- If transmitting outside anechoic chamber the test must be coordinated with NOAA prior to activation.
- Should use self-test function and a hand held local test verification unit



Coordination - Training

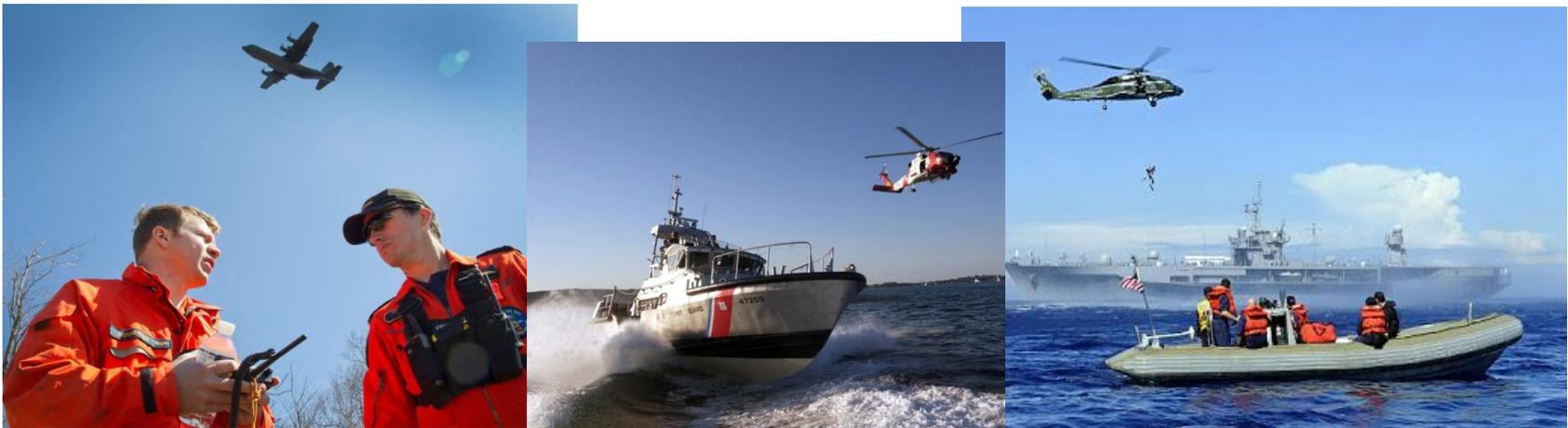
- Training: USCG and USAF coordinate with NOAA.
- Transmission should be limited to the test protocol.
 - Test beacons usually have offset homing frequency
 - Example, 121.75 MHz instead of 121.5 MHz
- Operational protocol can be supported in limited cases
- Please share this info with your SAR forces





Coordination – Operational Exercise

- Operational Exercise: USCGC and USAF coordinate with NOAA.
- Test Protocol Coded beacons are preferred; operational protocol can be supported in limited cases.





Operational Beacon Tests

MCC Coordination Lead Times

- 1-3 Beacons – 72 Hours before first event
- 4-6 beacons – 30 Days before first event
- 7+ beacons – Testing/training not allowed

- All MCCs shall be notified of tests using beacons.



Department of Defense

- USAF coordinates DOD, Civil Air Patrol, and State activation requests
 - USAF POC: **ACC Special Activities Branch**
 - Email: **AFRCC.Console@us.af.mil**
- * PLEASE DO NOT EMAIL BLAST USAF, USCG, and USMCC.**



U.S. Coast Guard

- USCG coordinates USCG and USCG Auxiliary activation requests
- USCG POC: Office of Search and Rescue
- Email: HQS-DG-M-406-TESTRequest@uscg.mil
- Phone: 202-372-2089
- *** PLEASE DO NOT EMAIL BLAST USAF, USCG, and USMCC.**



Final Approval

- NOAA coordinates all other activation requests
- NOAA POC: NOAA SARSAT Program
- Email: beacon.test@noaa.gov
- Phone 301-817-4538
- *** PLEASE DO NOT EMAIL BLAST USAF, USCG, and USMCC.**